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ABSTRACT

This experimental unit concerned with geometric concepts is one of a series being developed for preschool students. In this unit, children are to learn to predict shapes which could be the projections of other shapes. Five lessons are provided and detailed directions are specified; materials for a test on the subject matter are also included. For other documents in this series, see SE 016 124 through SE 016 129. (DT)

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Practical Paper No. 18

SHADOW GEOMETRY PROJECT

Edith G. Robinson

June, 1969

Research and Development Center in Educational Stimulation

University of Georgia Athens, Georgia

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SHADOW GEOMETRY PROJECT

by

Edith G. Robinson

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Research and Development Center in Educational Stimulation
University of Georgia
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June, 1969

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SHADOW GEOMETRY PROJECT

Desired outcome: Pupils are to learn to predict shapes which could be the projections of other shapes; the materials presented here contain many instances of shapes which are the projections of other shapes but the desired outcome is the ability to visualize projections not seen before and not simply to recall or recognize the examples presented in this unit.

Materials required:
- Source of light to cast a shadow
- Pieces of white cardborad
- Colored crayons
- Five wire "shapes" with colored tape for identification
- 14 5"x8" cards, with shapes copied exactly from pages 31 to 37

Lesson One

The materials (crayons, cardboard, shaped wires, etc.) should be brought out. Use only the triangle, circle, rectangle, and kidney bean wires. Please do not use or show the diamond shaped wire at this time. Please do use the color of the tape and not the name of the shape as the means of identification since the names of the shapes are irrelevant in this unit.

Teacher says, "BOYS AND GIRLS, TODAY WE ARE GOING TO MAKE SHADOWS (OR PLAY A SHADOW GAME)."

1. Directions: Hold the kidney bean up between the light and a piece of cardboard so that the shadow is clearly visible on the cardboard. Make sure the plane of the wire is parallel to the plane of the cardboard.

Teacher asks, "DOES EVERYONE SEE THE SHADOW OF THIS SHAPE?"

Directions: Have the children observe the shadow and then trace the shadow (only the shadow - do not fill in) with a black crayon.

Teacher says, "NOW WE'LL PLACE A MARK ON THE BACK OF THE CARDBOARD, USING THE SAME COLOR AS THE TAPE ON THIS SHAPE TO REMIND US WHICH SHAPE MADE THIS SHADOW."

Directions: After the mark has been made on the cardboard, set it aside for later use.

2. Directions: Put up a new sheet of cardboard and use the same kidney bean shape.

Teacher asks, "IF I TURN THIS SHAPE A BIT, DO YOU THINK THE SHADOW WILL LOOK THE SAME?"

Regardless of what the children say, teacher says; "WELL, LET'S SEE IF YOU'RE RIGHT."

Directions: Turn the wire, but not enough to project a line segment as shadow.

Teacher asks, "WAS YOUR GUESS RIGHT?"

Directions: As before, trace the shadow with a black crayon, place an identifying mark on the back, and set aside.

3. Directions: Repeat 2 so as to get a shadow markedly different in shape from the first two.

4. Directions: Hold up the circular wire.

Teacher asks, "DO YOU THINK THIS SHAPE WILL MAKE A SHADOW LIKE ANY WE'VE JUST MADE?"

Regardless of what the children say, teacher says; "LET'S SEE IF YOU'RE RIGHT."

Directions: Project a shadow, trace the shadow in black, place an identifying mark on the back, and set aside.

5. Directions: Turn the circular wire and proceed as in 2, being careful not to project a line segment.

6. Directions: Use your own judgment at this point. Either project shadows from the triangle or rectangle, or leave shapes out for the children to play with by themselves.

Lesson Two

Directions: A day or two after Lesson One, bring out the four wires and the cards with the shadows drawn on them. Please have the cards in a different order from that in which they were drawn.

1. Holding up one card, teacher asks, "CAN YOU REMEMBER WHICH SHAPE MADE THIS SHADOW?"

Directions: Depending on reply, do (a), (b), or (c) below:

(a) If most of the children give the correct answer, show them the colored mark on the back to let them know they were right.

(b) If none of the children (or only one or two) recall the shape which made the shadow, show the mark on the back of the card and demonstrate how to get that particular shadow from the wire shape.

(c) If some children give the correct answer but some suggest that it could have come from one of the other shapes, show the mark on the back and then ask some children who think it could have come from another shape to demonstrate. Again, guide the children to the correct conclusion.

2. Directions: Repeat the above procedure (1) with each one of the cards on which you have drawn shadows.

Lesson Three

Directions: Arrange the cards, on which you have drawn shadows, in a different order and repeat Lesson Two. Please use your judgment as to the amount of practice needed in matching these shadows to shapes. Practice should be continued until the children are reasonably proficient with these cards.

Lesson Four

Directions: Make a set of fourteen cards like those pictured on pages 31 to 37. Use these cards in the order in which they occur in this manual. The four wires you have previously used should be displayed.

1. Holding up the first card, teacher asks, "CAN THIS SHAPE BE THE SHADOW OF ONE OF THE WIRES?"

Directions: (a) If the response if no, then ask the children to explain.
(b) If the response if yes, then ask a child to come demonstrate.

2. Continue as in 1, until all cards have been shown. Please allow free discussion, but be sure the children eventually understand which answer is correct for each card.

Note: Lesson Four might be repeated a second day before going on to Lesson Five, if review is necessary.

Lesson Five

Directions: For this exercise, use only the triangular wire, the rectangular wire, and the diamond-shaped (new) wire. The cards to be used are those already presented in Lesson Four. The cards should be thumbtacked to the bulletin board or otherwise mounted so that all pupils can see them.

1. Show the wires to the children, then ask, "WHICH OF THE CARDS SHOW SHAPES WHICH CANNOT BE THE SHADOW OF ANY OF THESE WIRES?"

Directions: As the shapes (cards) are identified, ask if all agree and why. Then mount these cards on a different part of the bulletin board so that they obviously form a special subset. (Allow some experimentation with the new wire if this seems desirable.)

When the special subset is complete, make sure the children understand that these shapes are the only ones which cannot represent shadows of the wires.

2. Directions: Show the triangular wire and ask which of the remaining pictures could represent a shadow of this wire. As these are identified, ask if the children agree, and place these in a row above the other cards. Ask the children to look carefully to see if all the pictures which could be the shadows of this wire are in place.

3. Directions: Show the rectangular wire and proceed as above, placing the cards selected in a separate row. Again, ask the children to look carefully to see if they have all the pictures which could be shadows of "this wire". The last question is especially important since the picture of the segment should go in this row also.

4. Directions: Show the diamond-shaped wire, and repeat the above procedure.

5. Directions: Point out to the children that all the cards have now been placed in one or other of the collections. See if they can explain why none are left over.

Ask if there were any pictures which showed shadows of all three wires, and which this is. See if anyone can explain why this is so.

Test Administration

Teachers' Directions

General Remarks:

1. It is very important that the children understand exactly what they are to do on the test blanks, and the teacher should feel free to help them as much as necessary in understanding the directions. The reason for this is that we cannot use this instrument to assess learning if the directions are not followed.

2. Essentially, the test consists of twelve pictures of shadows and some pictures of wire forms. The child is to mark all pictures of wires which could make the shadow. If none of the wires could make a particular shadow, he should mark no. (Have the children mark each picture in the way they themselves understand. We will try to decode the markings.)

3. You will find that there are two sample pages to help you explain the directions, and that, on the remaining pages, the child is to mark something on every page. This should make it easy for you to tell if he has skipped a question.

4. Have all the wire forms that you used in the lessons on display before the class. Each child will need a pencil or crayon.

5. Please fill out the first page of each test except for age and score. These items will be completed by the investigators.

Specific Suggestions:

1. Distribute the test booklets and then hold up the wire forms. Ask the children if they remember them and what you did with them.

2. Have the children turn to the first page and call their attention to the pictures at the bottom. They need to recognize that there are four pictures of wires at the bottom of the page -- three of wires you used in the lessons and one that is different. To explain this, you might hold up the triangular wire and ask if they see a picture of that wire. Have them point to it.

Then repeat with the other wires. Be sure that the children recognize those pictures which show wire that you used and also can pick out the picture of the different wire. Also be sure that they recognize the handles on the wires in the picture.

3. Now have the children turn to the next page and notice the picture of the shadow in addition to be pictures of the wires at the bottom. Ask if any of the wires shown at the bottom could make a shadow like that. Help them to see that two of the wires (and) could. Tell them to mark both these pictures. Be sure that everyone marks both.

4. Tell the children that on the other pages are other pictures of shadows. They are to mark all the wires that could make that shadow. If the shadow can't be made from any of the wires, mark no (call it the red box or whatever you feel is appropriate for your group).

5. Have the children begin to mark their test papers. Walk around to see that everyone is following directions. Do not give answers, but if a child is having trouble you might ask him which wire could make the shadow and show him how to record the answer he thinks is right.

6. Allow some reasonable time for completion of the test, and encourage the slower children to finish up. We would like all children to complete all items. Please check to make sure they have not skipped any.

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AGE_____

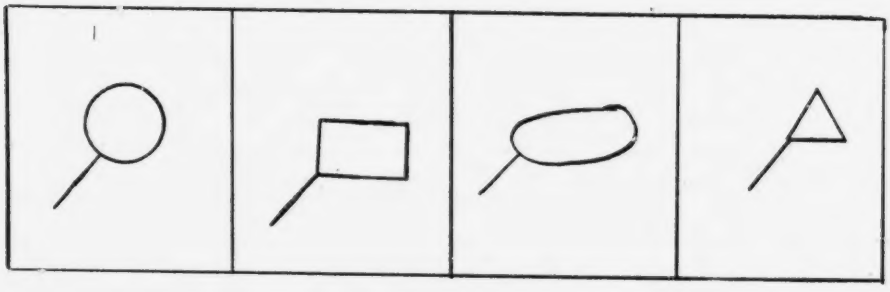
DATE OF BIRTH _____

DATE OF TEST _____

SCHOOL _____

TEACHER _____

SCORE _____



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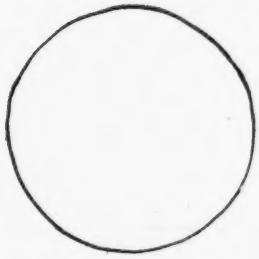

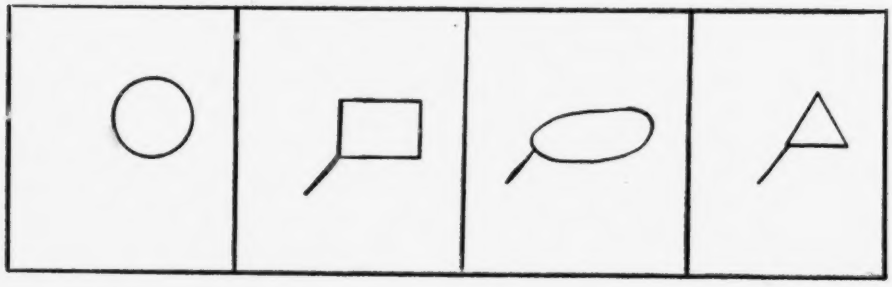

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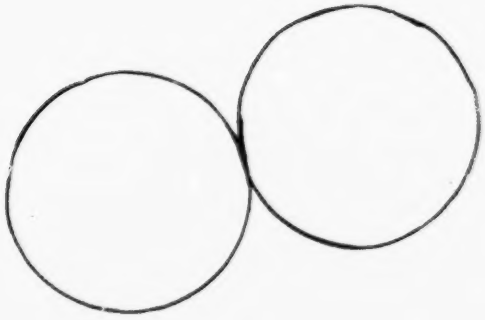

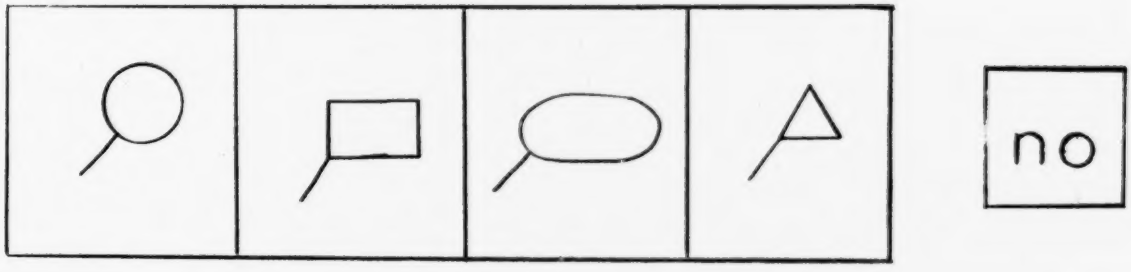
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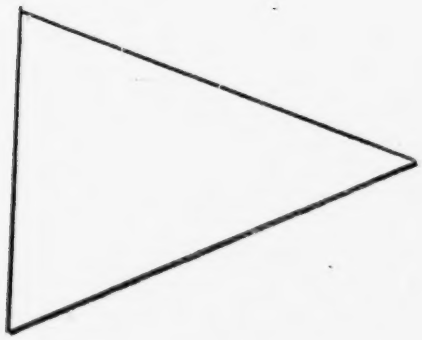

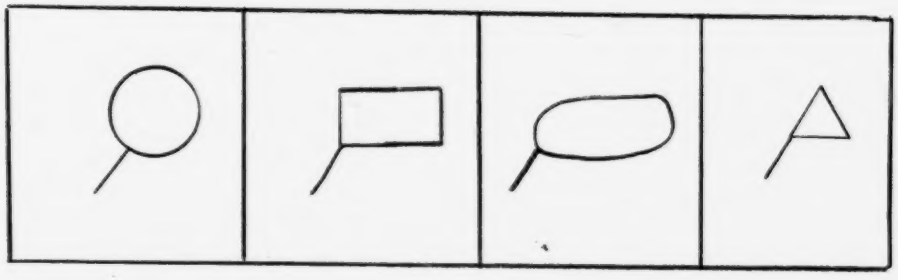

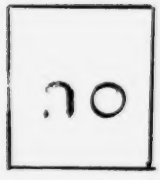

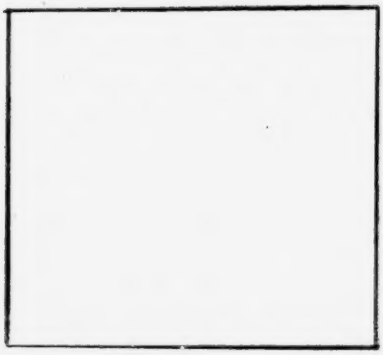

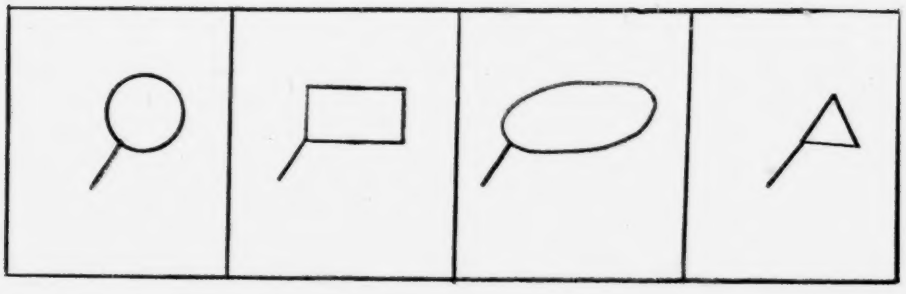
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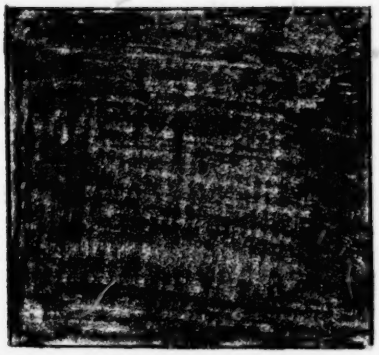

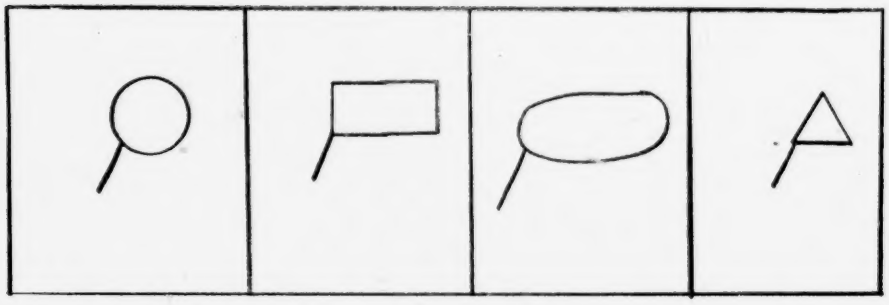
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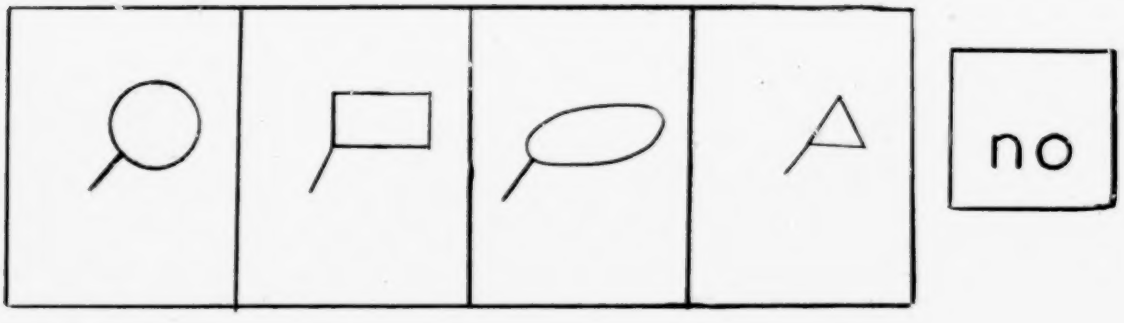
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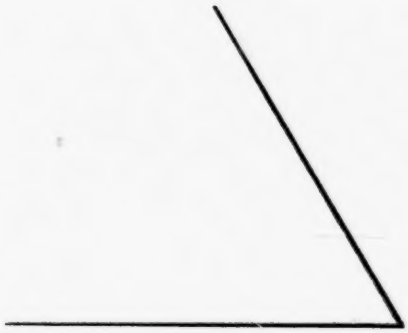

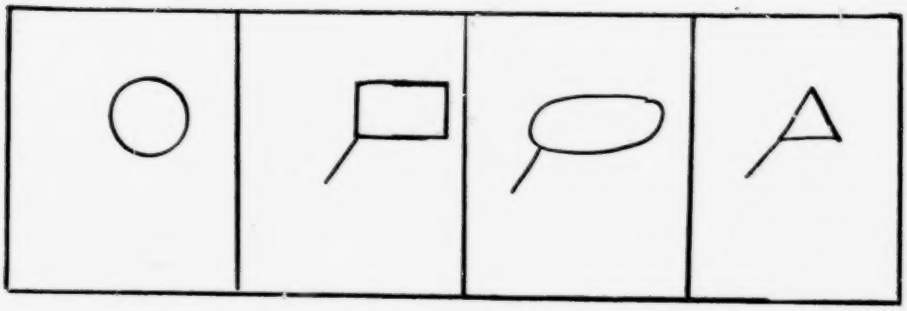
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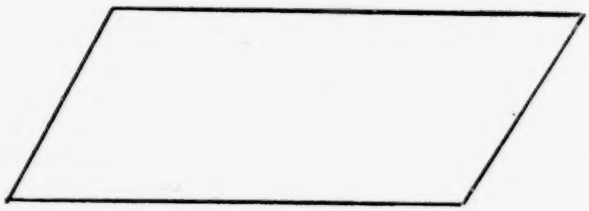

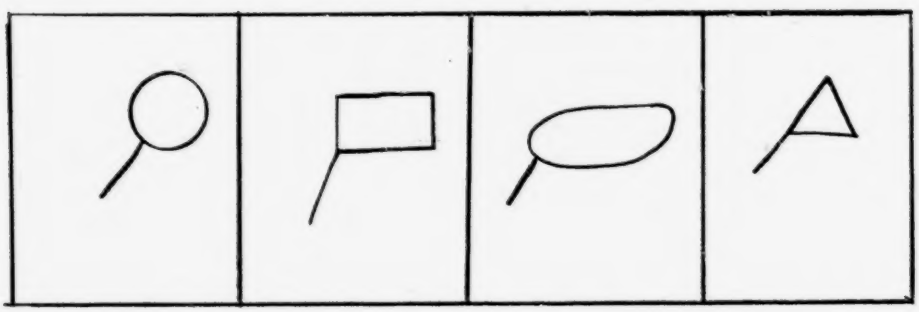

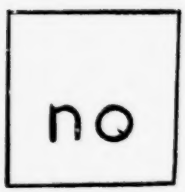
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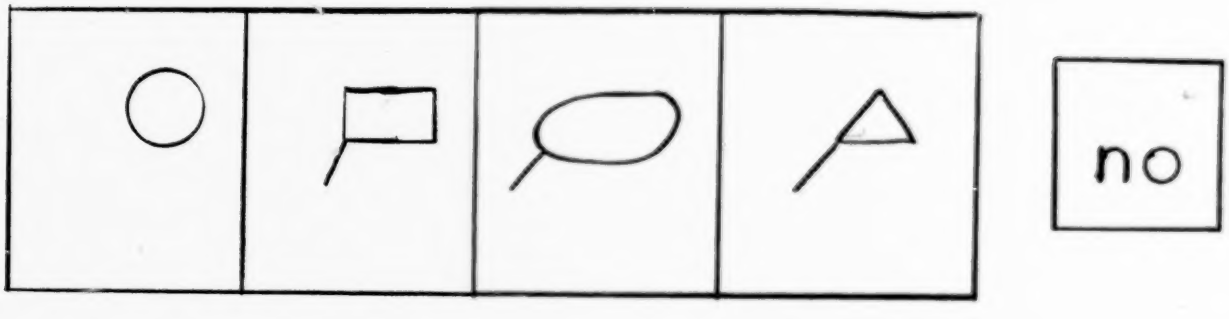
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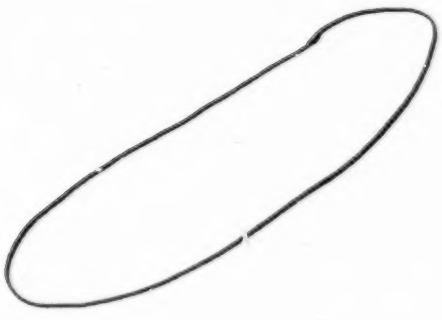

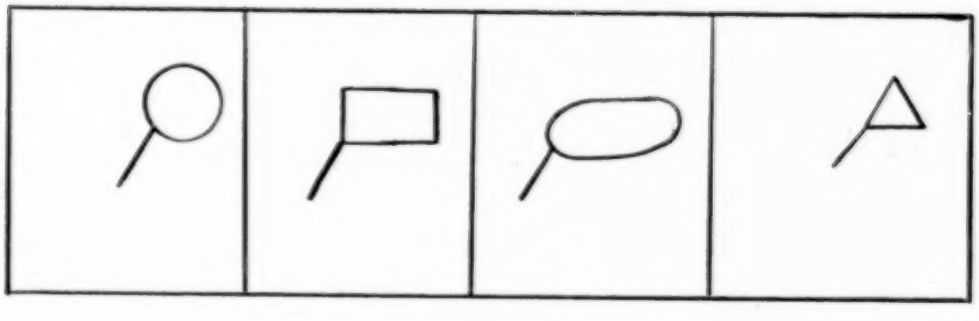

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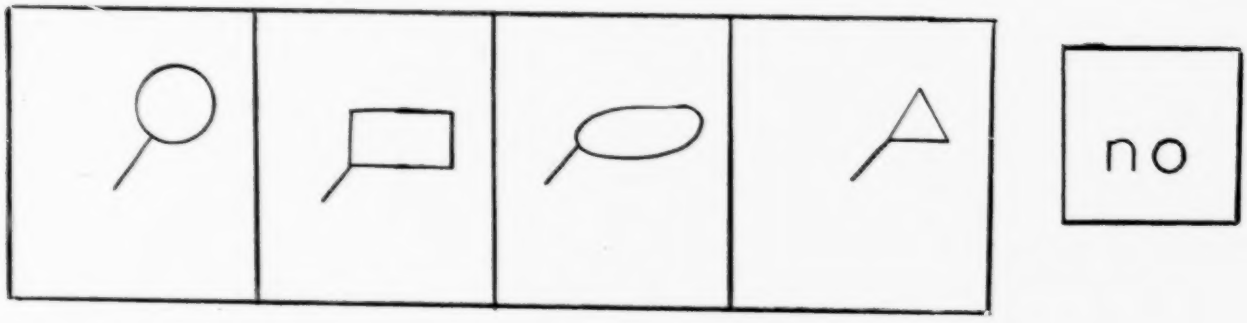
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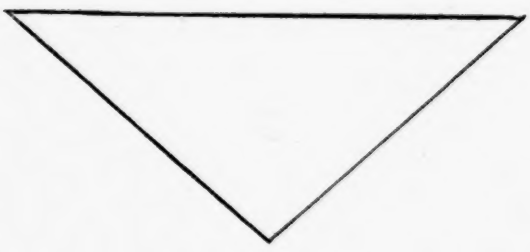

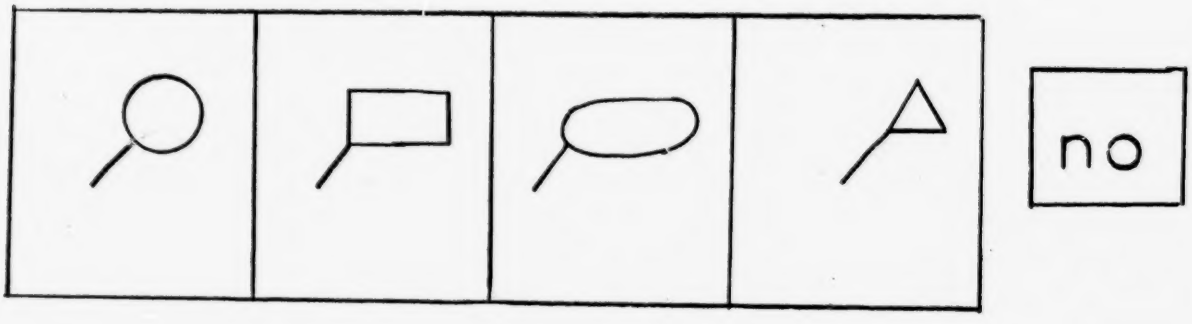
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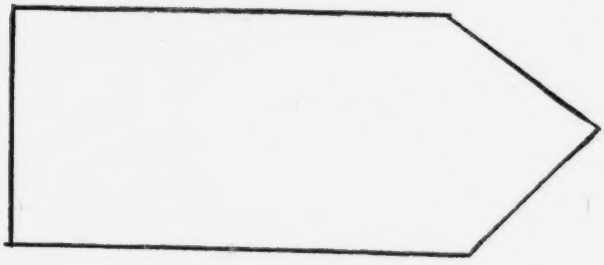

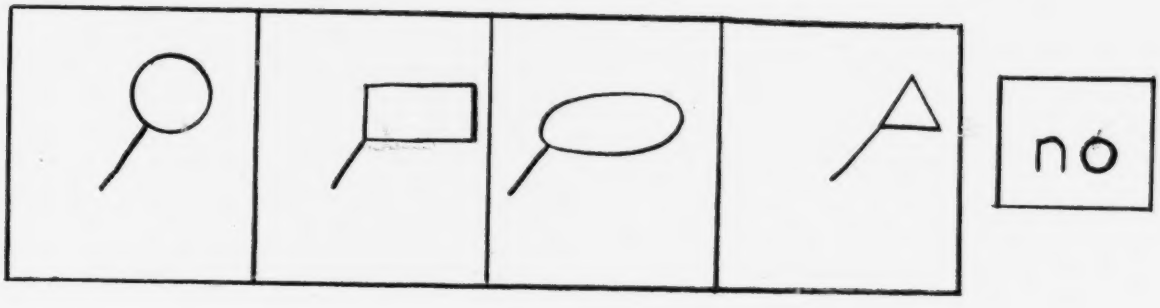
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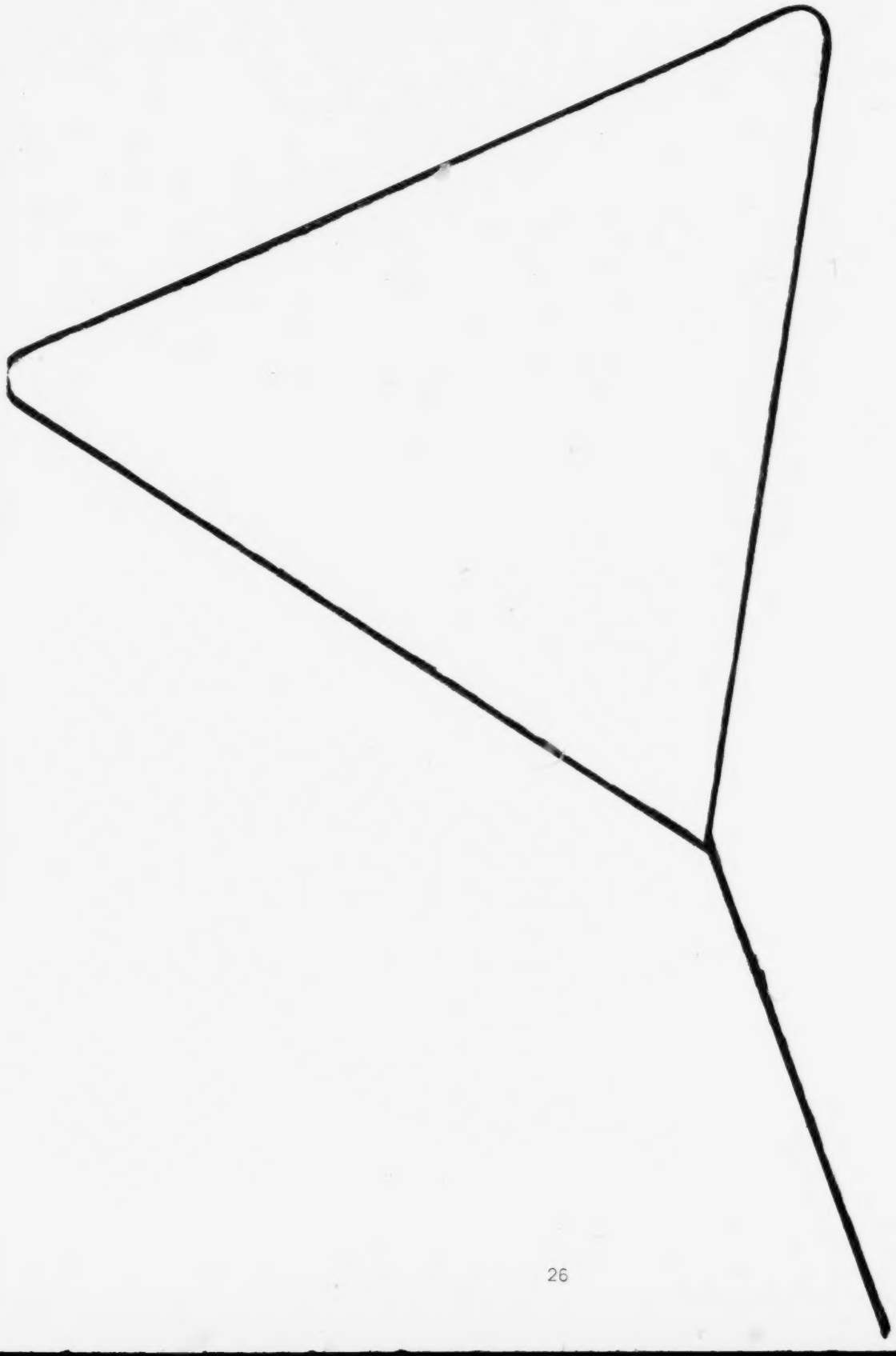

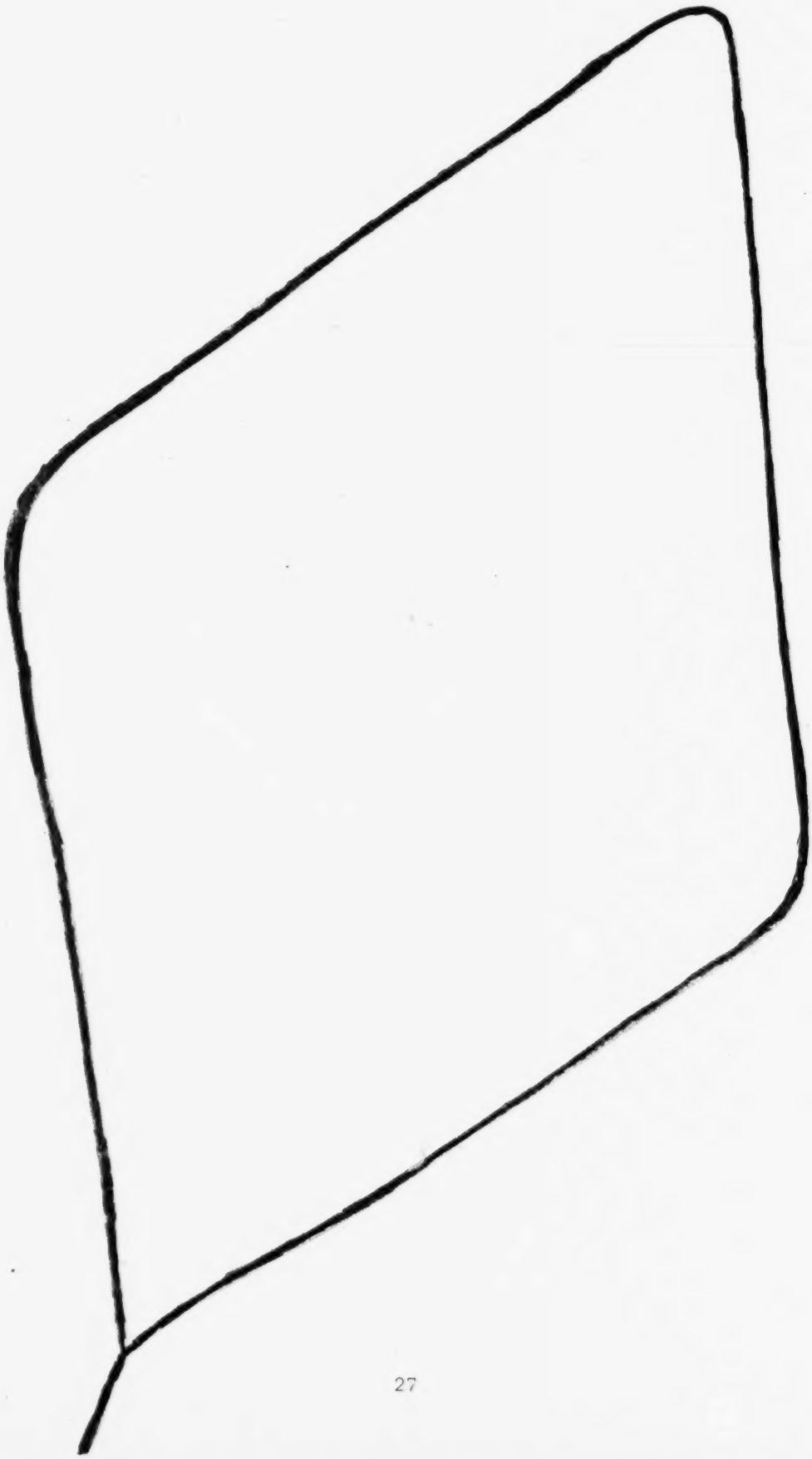

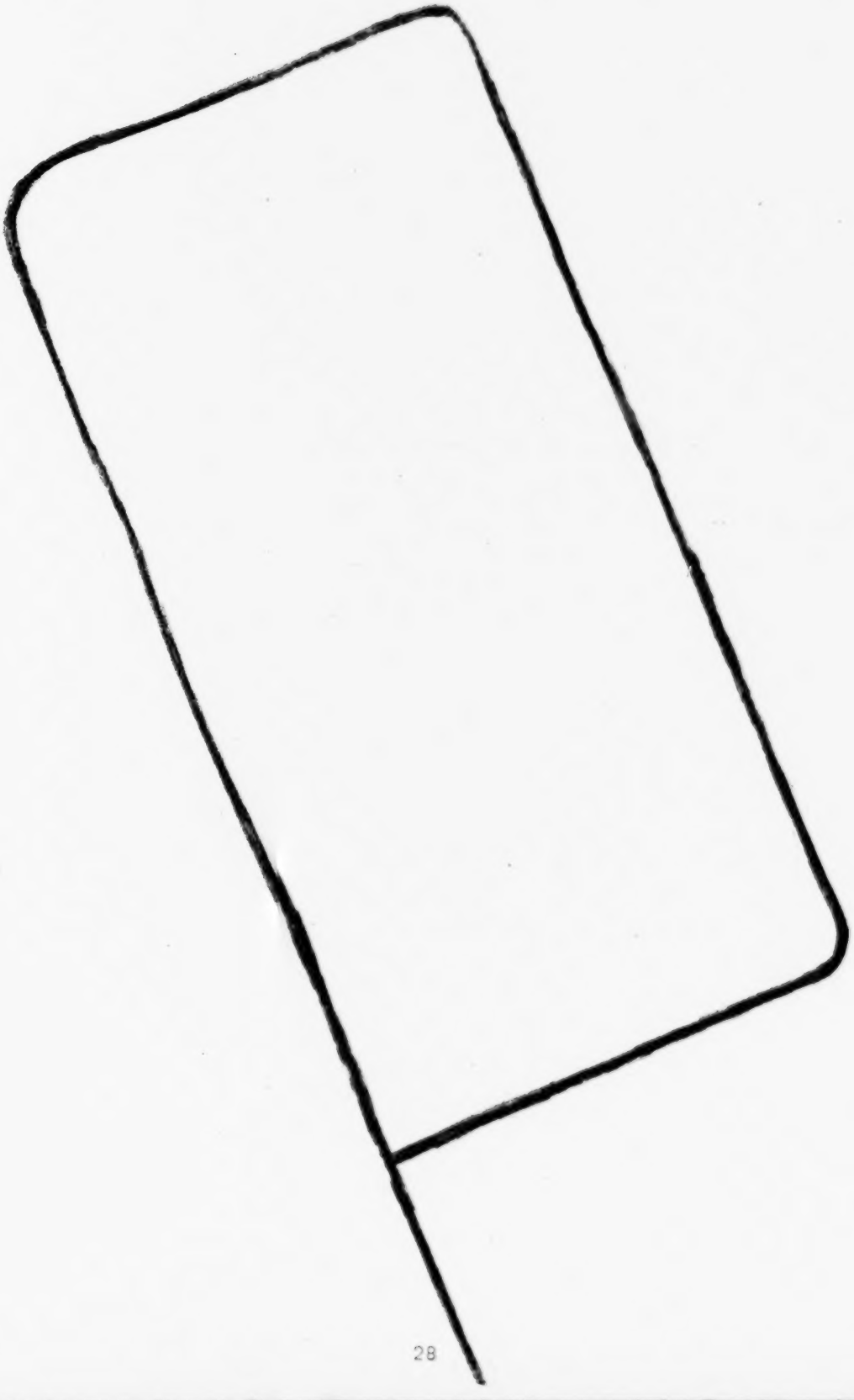

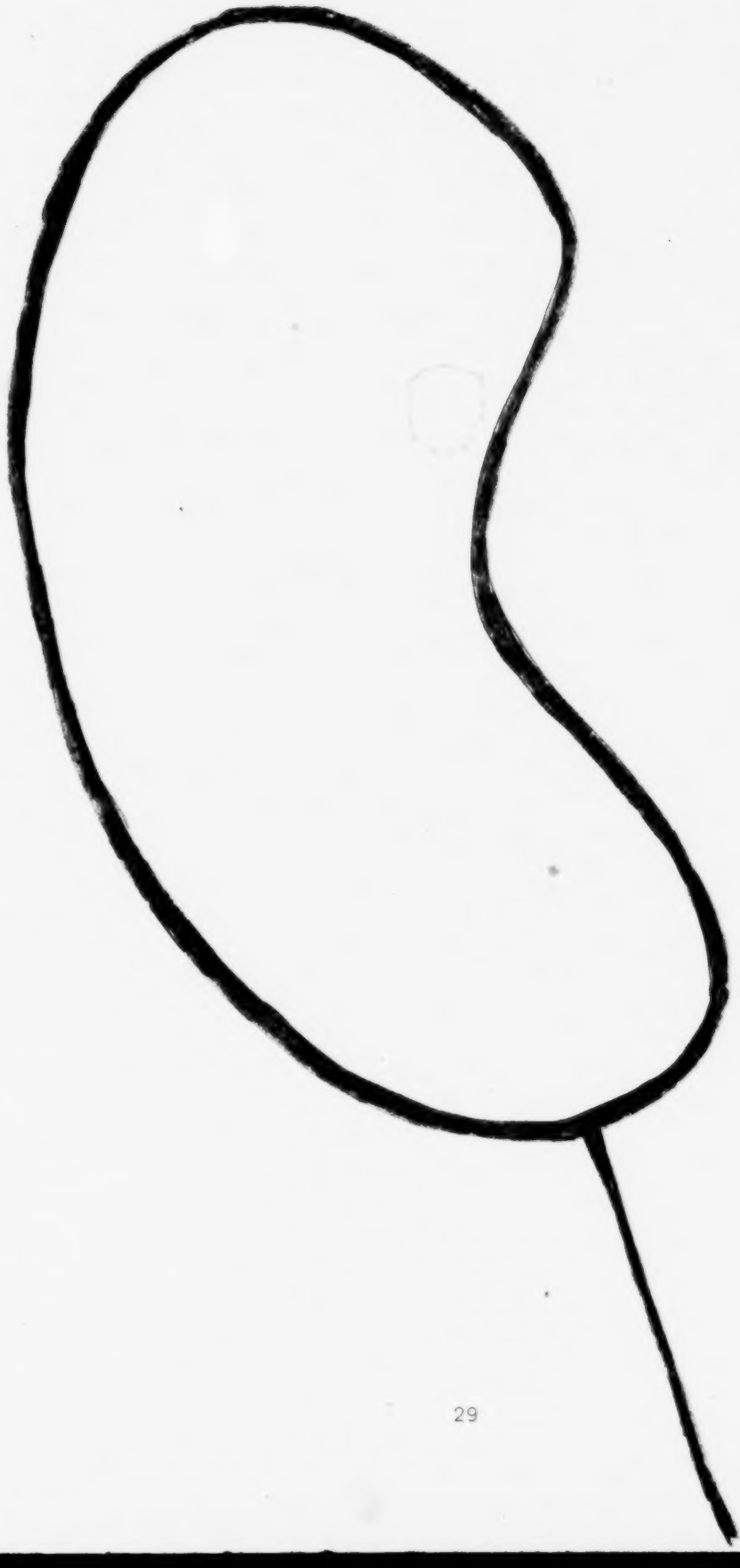

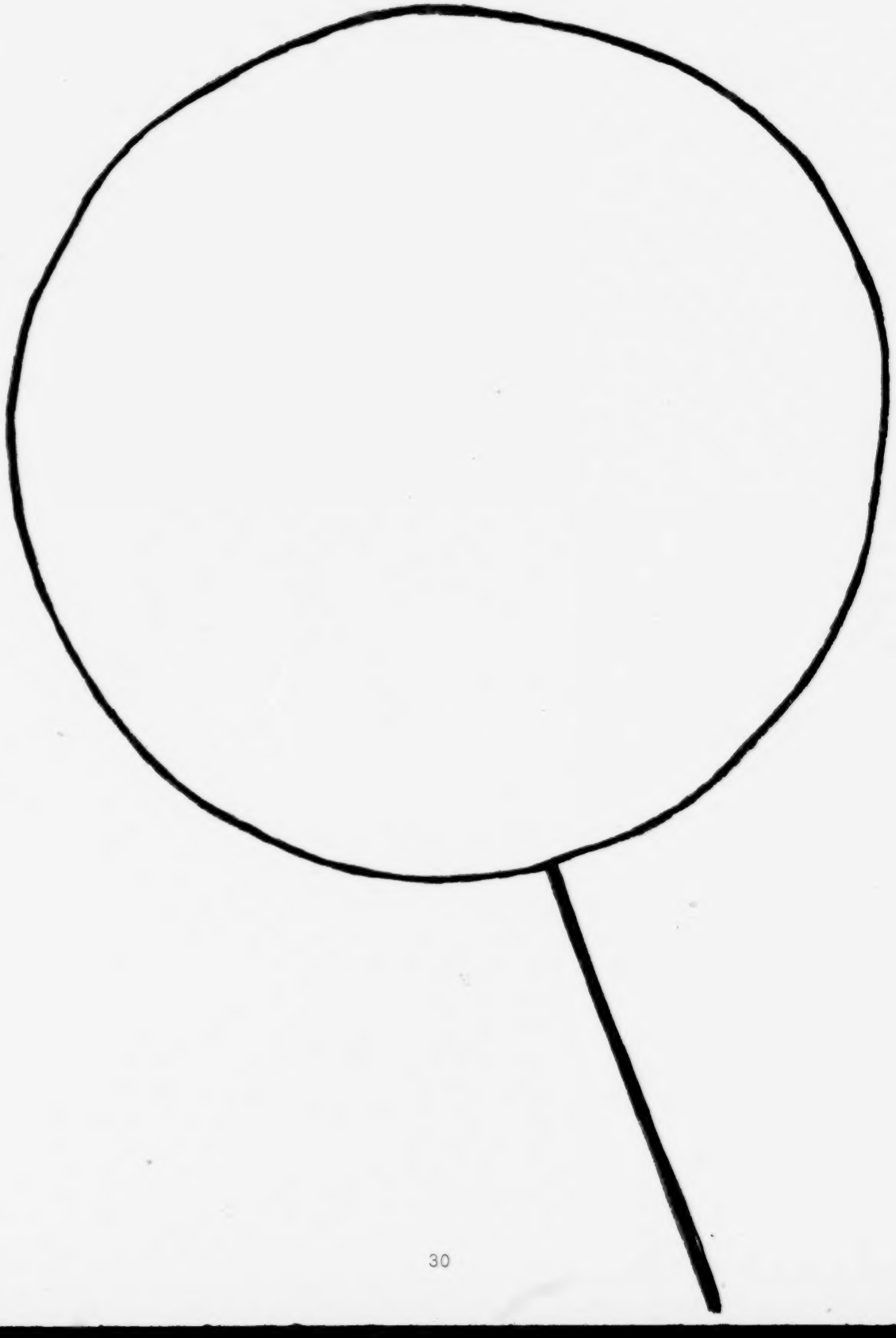

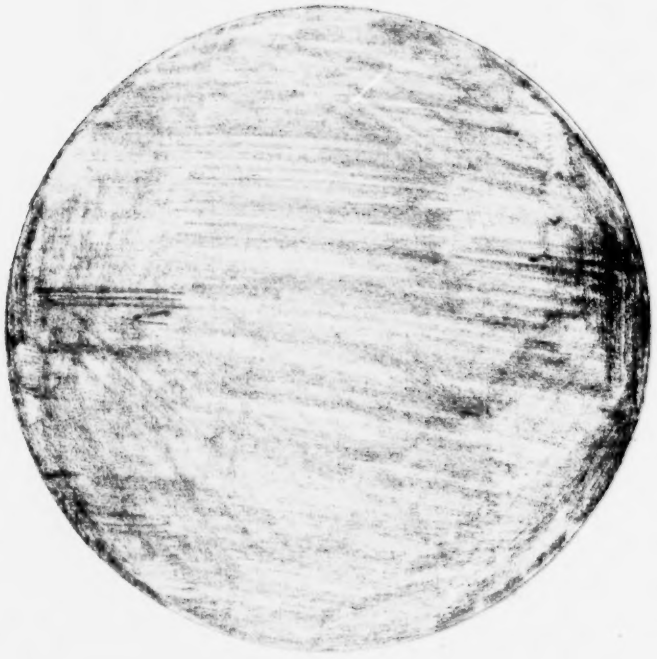

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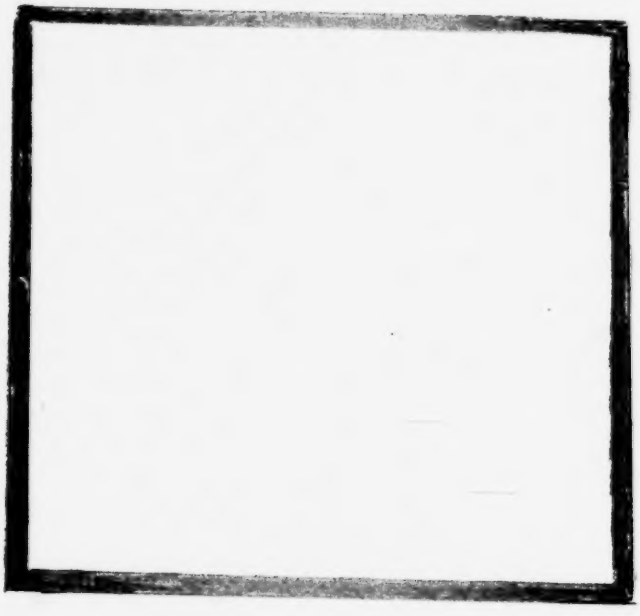
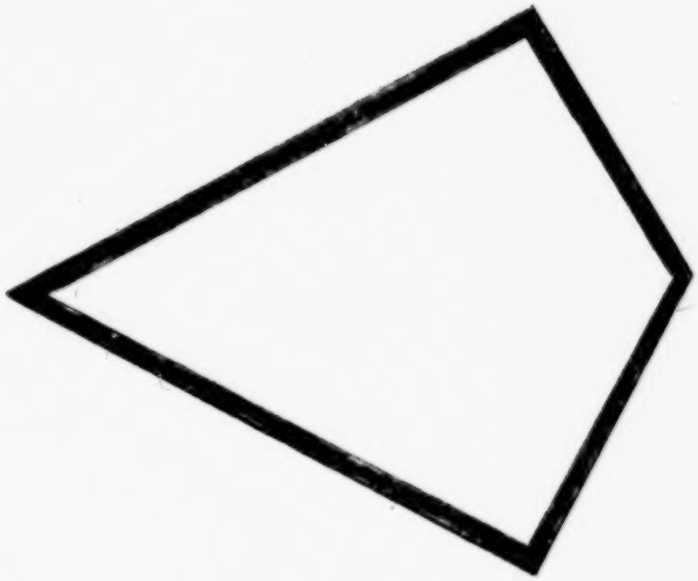


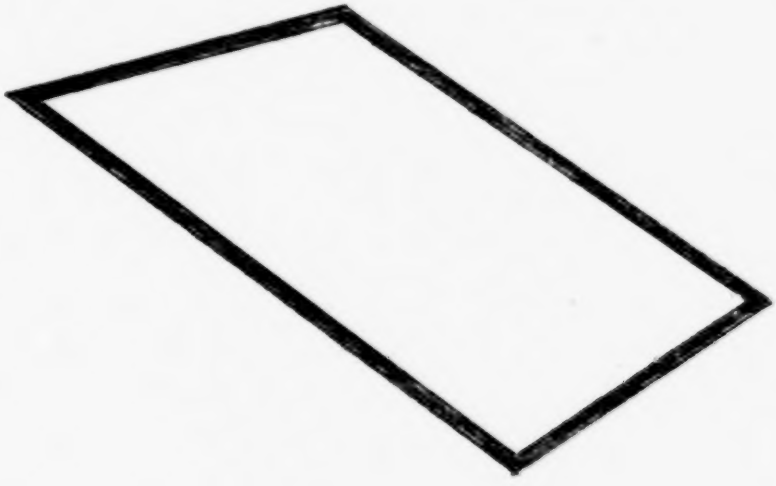
Card 2

Card 3



Card 4

Card 5



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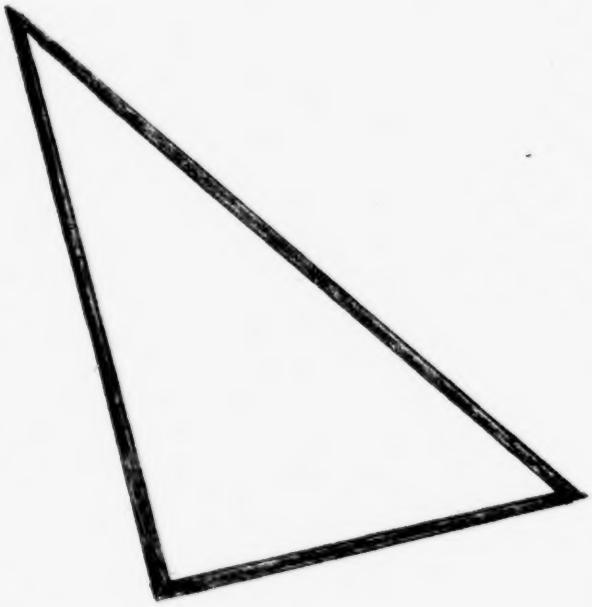
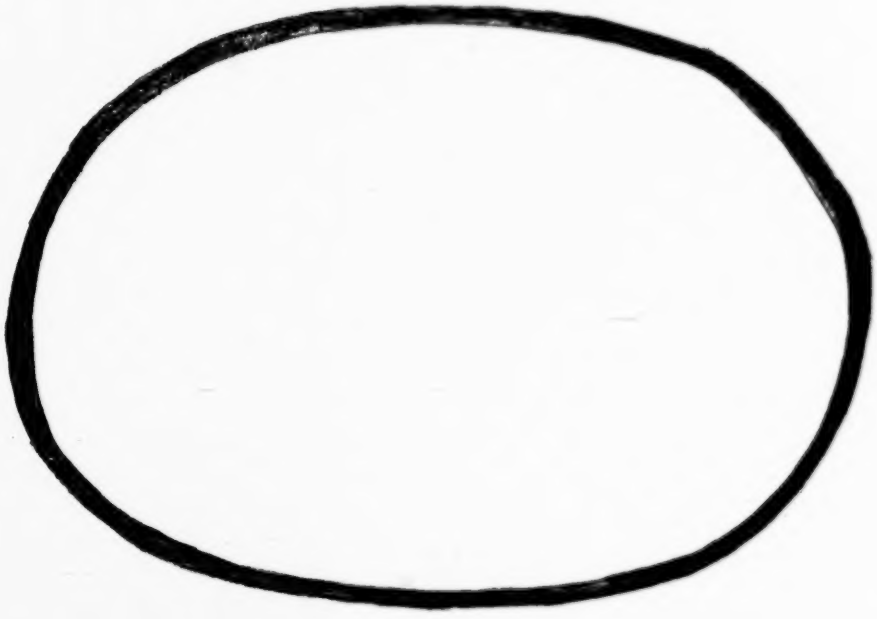


Card 7

Card 8

Card 9



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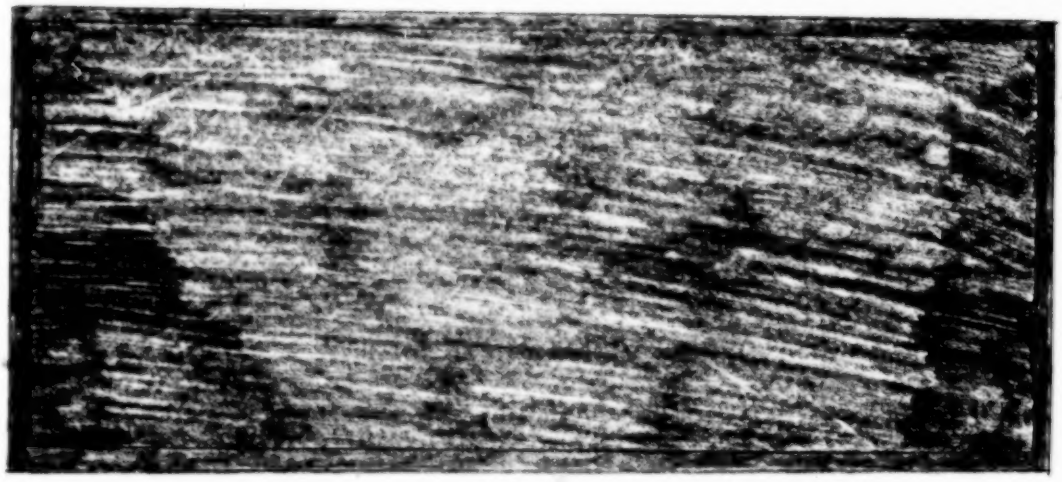
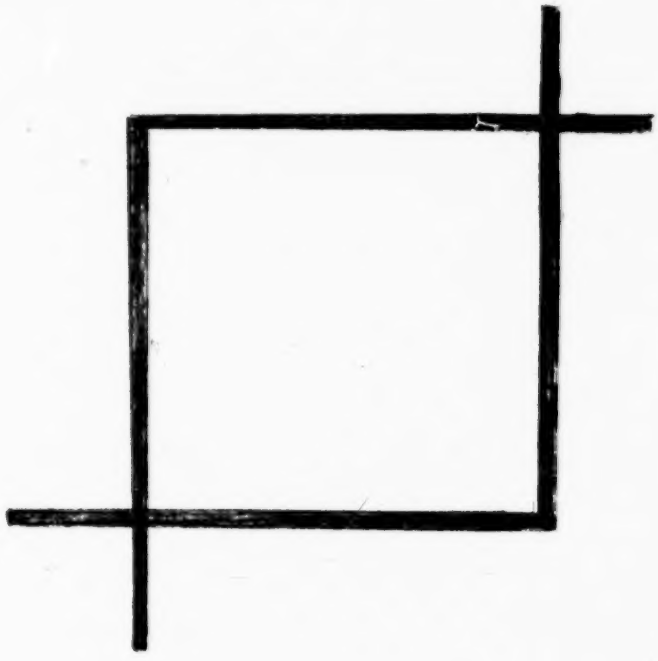
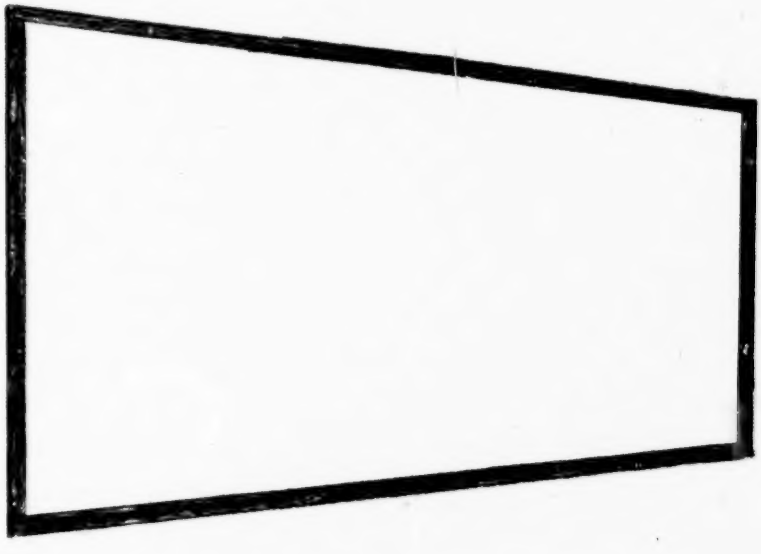


Card

Card 12



Card 13



Card 14